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SCIENTIFIC AND TECHNICAL SESSION ON ELECTRIC DRIVES IN THE TEXTILE INDUSTRY

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A scientific and technical session on electric drives in the textile industry, organized by MONITOE (Moscow Branch of the All-Union Scientific and Technical Society of Power Engineers), VNITO (All-Union Scientific and Technical Society) of Textile Workers, and the House of Engineers and Technicians imeni Dzerzhinskiy, was held in Moscow from 19 to 22 September 1950. Delegates representing more than 100 enterprises, scientific research, and educational institutions and organizations participated. In addition, about 100 guests took part in the proceedings.

N. S. Ryzhov, Deputy Minister of Light Industry USSR, opened the sessions with a speech on the great influence of automatic electric drives on technological processes and machine-building techniques in the textile industry. He announced that the ministry was drawing up plans for further introduction of automatic controls in these industries.

Ya. V. Mil'man Candidate of Technical Science, Moscow Textile Institute, spoke on tendencies in developing automatic electric drives for textile machinery. He classified the chief textile processes and machines on the basis of their need for this drive, dividing the machines into two groups: (1) machines for processing fabrics; and (2) machines for removing chemical residues, and auxiliary machines. Machines of the first group need a wide range of speed control and are usually incorporated into units equipped with a multimotor drive.

Engineering-economic analysis of various electrical systems used in these machines showed the advantages of employing dc motors fed by a regulated generator. Machines of the second group do not require speed control in operation and, therefore, may be driven by conventional squirrel-cage induction motors. Control of electric drives in the textile industry has been based, in the past, on

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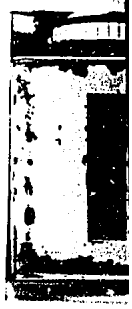

relay-contactor apparatus. In recent years, however, electric-machine /amplidyne/ and electronic systems have been introduced which open unlimited possibilities for automatic control of production processes. The report also indicated the need for some improvement in quality and a wider selection of starter equipment.

V. P. Belov, Candidate of Technical Science, NIILTekmash (Scientific Research Institute of Light- and Textile-Machine Building) Moscow, read a report on "Prospective Improvements in Textile Machinery and the Requirements for Modern Electric Drives," analyzing trends in building high-productivity textile machines (higher speed, mechanization of manual operations, automatically controlled work pieces, automatic regulators for temperature, levels, pressure, moisture, etc.).

Engineer I. G. Obukh TsNIIKhBI (Central Scientific Research Institute of the Cotton Industry), Moscow, read a paper on "Spinning Machine Drives." After noting the complexity and unreliable operation of commutator (slip-ring) motors with spinning control, he explained the working principles of the friction changer in the Svetozarov system, which, when combined with the regulator designed by the author, afforded complete control.

In his report, "Modern Problems Relating to Electric Weaving-Machine Drives," L. B. Geyler, Doctor of Technical Science, Scientific Research Laboratory, "Elektroprivod" (Electric-Drive) Trust, MEP (Ministry of the Electrical Industry), stressed the necessity of choosing motors with special mechanical characteristics to drive weaving machines because of the abrupt variations in their load graph. He suggested a method for finding the optimum mechanical characteristic and an approximate method of determining the moments and speed of weaving machine motors.

Docent A. M. Bystrov, Candidate of Technical Science, ENIN (Power Engineering Institute), Ivanovo, made a report on "The Electric Drive in the Manufacture of Finished Textile Fabrics." He pointed out that textile-machinery plants were trying to equip all their machines with individual, automatically controlled drives and were introducing machine units with multimotor drives. He described the electric drive of the basic finishing machines, which required smooth speed control. Both shunt-regulated dc motors, as well as motors fed from regulated generators, should be used for this type of control. Commutator motors operating on a three-phase ac circuit could be used in many machines. For nonregulated drives in finishing work, enclosed squirrel-cage induction motors were recommended.

B. F. Kozlov, Candidate of Technical Science, NIILTekmash, spoke about new types of textile machinery -- reeling, warping, and sizing machines, on which the quality and quantity of production depended. The modern drive for high-speed warping machines, designed by NIILTekmash, was provided by a dc motor which set the warp beam in motion. Smooth acceleration was obtained by a stabilizing transformer, the secondary winding of which was connected to one of the control windings of the electric-machine amplifier /amplidyne/ used as a regulated generator feeding the drive motor. The speed of the drive motor was automatically controlled by a potentiometer connected in series with one of the control windings of the amplidyne. The potentiometer was actuated by a mechanism designed to keep the linear speed of the warp constant. NIILTekmash also designed a driving mechanism for sizing machines, consisting of two dc motors, one of which actuated the reeling mechanism and the other, the main shaft. The motors were fed according to the regulated-generator scheme in which amplidynes were used as generators. This arrangement facilitated automatic regulation of the moisture and stretch of the warp threads.

Engineer S. S. Shvyrev, TsNIIKhBI, spoke on the results of research on electric drives for carding machines. Because these machines consumed little power under static conditions and their flywheel moment often exceeded that of the motor, they required a great deal of power in starting. To facilitate starting conditions, a friction coupling was introduced. It was found that when the flywheel moment was 1,100 kg-m^2 and the friction coupling was correctly adjusted, the acceleration period was 100 sec, and the equivalent current at starting was 160% of rated current. With incorrect coupling regulation, the current reached 400% of rated in the first 50 sec, overheating the motor and shortening its life. Careful regulation of the coupling and more heat-resistant insulation of the motor remedied these defects.

In his report on "Frequency-Converting Installations and Networks with Higher Frequency in the Artificial-Fiber Industry," Engineer A. G. Kuznetsov, State Planning Institute for Artificial Fiber, Moscow, recommended induction generators operating at higher frequency as the best type for use in rotary converters. He urged further development of electronic and ionic frequency converters and of V. P. Vologdin's frequency-multiplier systems.

Engineer I. P. Sakharov, All-Union Scientific Research Institute of Artificial Fiber, Moscow, read a paper on "Electrocentrifuges of Higher Frequency in the Artificial-Fiber Industry and Methods of Improving Them." After pointing out the basic importance of centrifugal methods in spinning artificial fiber, he analyzed present machines and concluded that spinning centrifuges could be improved by using larger, more durable disks; increasing the speed of electrocentrifuges to 10,000 rpm; sealing the housing hermetically; and introducing new electric spindles with flexible shafts.

A group of speakers related their experiences in operating electrically driven machines in the textile industry. The group included Engineer Yu. Yu. Abramov, Textile Combine imeni Sta in, Tashkent; Engineer N. S. Kostrovskiy, Fabrika imeni Zhelyabov, Leningrad; Engineer G. I. Mel'nikov, Melanzhevyy Combine imeni Frolov, Ivanovo; Engineer I. V. Kostin, "Kvasnaya Roza" Combine, Moscow; and Engineer I. S. Malyusov, Ivanovo Office, Power Trust for Light Industry. They all pointed out the main defects in the electric drives of old and new machines. Belt and v-drives often got out of order; gear drives in warping and sizing machines did not operate satisfactorily; there was little choice in starters; starters and automatic parts were often poorly arranged in the machine and made operation difficult; the power of installed motors was too high, tending to lower the power factor and efficiency. The poor quality of motors of types MTO, TPF, and URAL, among others, and of magnetic starters MT-122, MP-15, starter VTP-10, etc., caused a sharp rise in the number of breakdowns; commutator motors with spinning control for spinning-machine drives were unsatisfactory in design and operation and difficult to service; factories were refusing to use them; many enterprises, including the "Melanzhevyy" Combine imeni Frolov, had warned designers against unduly complicated drives; and experience had shown the need for thermal protection in starters for small motors, since existing fuses, at very low power, did not give the motor adequate protection.

Among other reports were: "Automatization of Machines for Stabilizing Caprone Articles," by Engineer V. G. Leshchenko, NIILTekmash; "New Types of Devices for Automatic Load Control in Electric Drives" and "Electrical Methods of Controlling Kinematic Accuracy in Drives Used in Light Industry," by Engineer O. V. Khorizomenov, Moscow Technological Institute of Light Industry imeni Kaganovich; and "Unified Series of Induction Motors," by Engineer Ya. S. Gurin, Technical Department, MEP.

B. P. Kozlov, Candidate of Technical Science, NIILTekmash, read a report on "Electric Control Equipment for Textile Machines," discussing the working principles of starters for the textile and light industries and the starters made by

plants under the Main Administration of Textile-Machine Building. Taking into consideration the need for safe and reliable operation, this administration had adopted the following voltages for the control circuits of textile-machine drives (in agreement with the central committee of the Textile Labor Union): (1) for simple drives with not more than two contactors and 12 circuit interrupters, not over 220 v between phases or phase and neutral conductor (in two-wire circuits); and (2) for complicated drives with more than two contacts and more than 12 circuits interrupters, 127 v. These two classifications refer to cases without technological contacts in the control circuit, in dry premises, and in the absence of noxious media. For control circuits with open technological contacts, 12 v were recommended; 36 v for machine drives in damp premises.

Control equipment for electric drives would be assembled in the form of magnetic control stations, comprising an integral unit of machines built by plants of the Main Administration of Textile Machine Building. The station housing should be dustproof. The above plants would also supply the following accessory equipment for the station: (a) transformers for 50-, 100-, and 250-watt control circuits with various combinations of windings (127, 220, 380, and 500 v primaries, and 127, 36, and 12 v secondaries); (b) RP-1 intermediate relays with two normally open and two normally closed contacts at voltages of 12, 110, and 36 v; (c) program regulators for 3, 6, and 12 control circuits; and (d) ac electronic time-delay relays capable of regulating time from 0.1 to 20 sec.

Lively discussion followed the reports. Resolutions were passed on further development of automatic controls of electric drives in light industries.

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